

WASTE MINIMIZATION/POLLUTION PREVENTION

This plan specifies the activities and methods Ames Laboratory employs to reduce the volume of waste generated at the Laboratory.

1.0 APPROVAL RECORD

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The official approval record for this document is maintained in the Training & Documents Office.

2.0 REVISION/REVIEW INFORMATION

The revision description for this document is available from and maintained by the author.

3.0 PURPOSE AND SCOPE

The Ames Laboratory's [Integrated Safety Management System Policy Statement](#) and the Waste Minimization/Pollution Prevention (WMPP) Plan illustrate the Laboratory's commitment to reduce waste generation, conserve energy and natural resources, and fully comply with state and federal laws, regulations and DOE Orders. The Laboratory recognizes the benefits of waste minimization practices, which include conservation of resources and providing a safe and healthy environment for employees and visitors. Ames Laboratory, with the help of its Environmental Management System Steering Committee, will explore feasible options to preserve resources and the environment.

3.1 Goals

- Minimize the generation of sanitary, hazardous, radioactive and mixed waste
- Maintain the spirit of Executive Order 13693
- Comply with DOE Order 436.1
- Promote pollution prevention, conservation of energy and natural resources
- Maintain the integration of the Laboratory's ISMS/EMS

4.0 ROLES AND RESPONSIBILITIES

4.1 Laboratory Director

The Laboratory Director is ultimately responsible for and will support the Waste Minimization/Pollution Prevention Plan. A line management philosophy is utilized to implement this plan, as many of the activities in this plan are the responsibility of all employees.

4.2 ESH&A

ESH&A staff will incorporate waste minimization, pollution prevention and affirmative procurement into training programs and procedures. The staff will monitor and track waste production and minimization efforts and develop new waste minimization/pollution prevention activities when feasible. Staff is responsible for data collection and entry into DOE systems.

4.3 Manager, Purchasing & Property Services

The manager of Purchasing & Property Services will provide data to ESH&A on EPA designated items per Executive Order 13693. The manager is also responsible for sourcing goods and services that supply EPA-designated products unless specified in section 5.8 of this document. The manager will also promote the purchasing of environmentally preferable products.

4.4 Program Directors/Department Managers/Group & Section Leaders

Program directors, department managers and group and section leaders are responsible for making sure personnel under their supervision are properly trained (i.e. Hazardous Waste Generator Training, General Employee Training), where applicable, and that their departments and/or groups are following the guidance of this document.

4.5 Employees

It is the responsibility of every employee to reduce, reuse and recycle whenever possible to do so. Employees are encouraged to contact ESH&A for guidance and support.

5.0 MAJOR PROGRAM ACTIVITIES

5.1 Source Reduction

Source reduction is the primary objective for minimizing hazardous waste. Substitution of raw materials, inventory control, housekeeping and maintenance are keys to reducing waste.

5.2 Substitution of Raw Materials

Whenever possible, non-hazardous materials should be substituted for materials which produce hazardous waste.

5.2.1 Examples of Substitution:

- *Glassware Cleaning Solutions:* Alconox® or similar detergents should be used as an alternative to chromic acid to reduce the potential for exposure and the amount of hazardous waste generated.
- *Mercury and Mercury Compounds:* Alternatives for procedures that specify mercury or other toxic metal catalysts should be investigated. Mercury is toxic and can be costly when it comes to disposal.

- **Metals:** Investigate alternatives to using the following metals: antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, silver and titanium because they are toxic and disposal can be expensive.
- **Halogenated & Non-halogenated Solvents:** Efforts should be made to substitute with a less hazardous solvent. If substitution is not a viable option, the use of non-halogenated solvents is preferable to halogenated solvents due to their lower toxicity. Examples for substitutes are:
 - Citric acid-based solutions
 - Methyl soyate
 - Simple alcohols and ketones for toluene and xylene
 - Xylene and hexane for benzene
- **Other Substitutions:**

Chemical	Substitute	Use
Acetamide	Stearic acid	Freezing point depression
Benzoyl peroxide	Lauryl peroxide	Some polymer catalysis
Carbon tetrachloride	Cyclohexane	Qualitative test for halides
Ethyl ether	Methyl t-butyl ether	Organic chemistry
Formaldehyde (Formalin)	Ethanol	Specimen storage
Formaldehyde (Formalin)	Formaldehyde from Flinn Scientific	Specimen storage
Organic solvent-based inks	Water-based inks	Printing
Peracetic acid	Hydrogen peroxide	Sterilization
Phenol/chloroform extractions	ProCipitate® from Biotech Support Group, LLC, QIAquick® Gel Extraction Kit from QIAGEN	Isolation and purification Of DNA
Sodium dichromate	Sodium hypochlorite	Oxidation reactions
Sulfide ion	Hydroxide ion	Qualitative test for heavy metals

A helpful web tool for finding environmentally preferred chemical substitutes is located at <http://ehs.mit.edu/greenchem/>.

5.3 Inventory Control

The practices below are encouraged to reduce the amount of hazardous waste generated from excess quantities, expired shelf life and spills.

5.3.1 Chemical Inventories

Each program/group should maintain a chemical inventory and update it annually. Chemical inventories are useful in preventing the purchase of chemicals already in stock and in keeping track of shelf life. An organized inventory also facilitates chemical sharing through research and support groups.

5.3.2 Chemical Purchasing

Each program/group should coordinate chemical purchasing through one person. Chemicals should be purchased in the smallest amount necessary to reduce storage

space. This will also reduce the potential for unused product to exceed its shelf life and/or have to be disposed of as waste.

5.4 Housekeeping and Maintenance

Chemical stock should be rotated and expiration dates should be tracked. New containers should be dated when they are received.

5.4.1 Chemical containers

Containers should be stored properly to avoid spills and leaks. Keeping containers closed as much as possible will minimize release to the air through evaporation.

5.4.2 Chemical waste

Wastes should be segregated as much as possible to facilitate recycling and/or disposal. Keep uncontaminated pump oil separate for recycling. Generators of hazardous waste are required to take Hazardous Waste Generator Training (AL-073). Policies and procedures regarding the collection and storage of hazardous waste, mixed waste and low level radioactive waste can be found in the [Ames Laboratory Waste Management Program Manual](#).

Fume hoods shall not be used to evaporate waste or to control odors from containers that are not properly sealed.

5.5 Process/Procedure Modification

When possible, experiments should be scaled down and procedures should be reviewed to identify areas for waste minimization.

5.6 Equipment or Technology Modification

Newer generations of automated equipment can result in waste reduction compared to older, less efficient models. Laboratory personnel are encouraged to focus efforts on technology to reduce paper consumption. Where possible, documents should be emailed instead of printing, and when hard copies are necessary, use the double-sided feature on the printer/copier.

5.7 Recycling/Reuse

Although source reduction is the preferred method of waste minimization, recycling is important and utilized by the Laboratory in waste minimization and conserving resources.

5.7.1 Chemical Redistribution

The Environment, Safety, Health & Assurance (ESH&A) office acts as the coordination point for chemical redistribution. In cases where chemicals still have value but are no longer needed by a particular researcher, a list of these chemicals will be e-mailed out to the Laboratory for possible redistribution. These chemicals are offered at no cost.

ESH&A maintains a combined chemical inventory for all research groups at Ames Laboratory. The inventory is updated annually. Researchers in need of a small amount of chemical should utilize the online searchable chemical [database](#). The chemical inventory database can be used to search for other users of the same chemical. Iowa State University – EH&S Chemical Redistribution [website](#) can also be used. If you need

assistance searching for a chemical please contact ESH&A (294-2153). Researchers are encouraged to share chemicals rather than purchasing new chemicals.

5.7.2 Metal Recycling

Ames Laboratory recycles and/or reuses scrap metal. Scrap metal is recycled through a scrap metal recycler. If the item has been exposed to chemical and/or radiological contaminants, contact ESH&A (294-2153) before sending it to be reused or recycled.

5.7.3 White Paper Recycling

White paper recycling containers are placed throughout Ames Laboratory. The white paper is currently picked-up by Iowa State University for recycling.

5.7.4 Styrofoam Peanuts

Employees of the Laboratory are encouraged to separate styrofoam peanuts from their trash so the peanuts can be reused as packaging material by the Laboratory's materials handling group.

5.7.5 CRT/Computer/Office Electronic Equipment Recycling

Cathode Ray Tubes and other miscellaneous equipment are collected and sent off-site to be recycled.

5.7.6 Battery Recycling

The Laboratory collects all types of batteries for recycling. Spent batteries, except lead acid, should be taken to the Ames Laboratory Storeroom, G40 TASF, or simply call ESH&A (294-2153) for a pick-up. Please call to have lead acid batteries picked-up.

5.7.7 Cardboard and Mixed Paper Recycling

Corrugated cardboard is collected on the docks of each building. Boxes should be taken to one of these locations. Boxes should be flattened and placed in the receptacle. Mixed paper is collected 1-2 times each year. However, if you have a large amount of mixed paper (i.e. journals, colored paper, calendars, magazines, etc.) to recycle please contact the ESH&A Office (294-2153).

5.7.8 Equipment reuse

Laboratory personnel are encouraged to use the [equipment pool](#) to recycle or reuse excess items within Ames Laboratory. The GSA and DOE have combined resources to form the [Energy Asset Disposal System](#) which can also be used to transfer equipment. For assistance, call ESH&A at 294-2153 or refer to the [Property Management Policy](#), section 19.4.

5.8 Sustainable Acquisitions

The Laboratory supports the purchase of environmentally sound goods and services in an effort to reduce energy use, conserve resources and minimize environmental impact.

5.8.1 Environmentally Preferred Purchasing (EPP)

Environmentally preferable means products or services that have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose.

The Environmental Protection Agency has designated several [products and services](#) that contain recycled materials and/or are environmentally preferred. These items should be purchased by the Laboratory. Designated items that **do not** contain recovered materials may be purchased if it is determined that:

- The price of a given designated item made with recovered materials is unreasonably high;
- There is inadequate competition (not enough sources of supply); or
- It does not meet the Laboratory's reasonable performance specifications.

For a complete list of designated products and content recommendations go to [The Comprehensive Procurement Guidelines](#).

5.8.2 *Electronic Product Environmental Assessment Tool (EPEAT)*

EPEAT is a system to help purchasers evaluate, compare and select all computers, monitors, tablets, televisions and imaging equipment based on their environmental attributes. Laboratory personnel are encouraged to use the [EPEAT webpage](#) when sourcing a computer. The Laboratory is contractually obligated to purchase EPEAT-registered equipment.

5.8.3 *Federal Energy Management Program (FEMP)*

[FEMP](#) provides agencies with the information, tools, and assistance they need to meet and track their energy-related requirements and goals. FEMP program areas include: Sustainable Buildings and Campuses, Operations and Maintenance, Water Use Reduction, Data Center Efficiency, Sustainable Federal Fleets and Laboratories for the 21st Century.

5.8.4 *Energy Star*

The EPA's ENERGY STAR program was developed to help reduce the amount of greenhouse gases through energy conservation. The program was designed to make it easy for consumers to identify and purchase energy-efficient products. The Laboratory is required to purchase ENERGY STAR rated energy consuming products. More information about the ENERGY STAR products for purchases can be found [here](#).

5.8.5 *Biobased Products*

[Biobased products](#) are derived from plants and other renewable materials and provide an alternative to conventional petroleum derived products. Biobased products include diverse categories such as lubricants, cleaning products, inks, fertilizers, and bioplastics. The use of these materials will minimize the hazards of any wastes created, and the laboratory provides these a number of these products in the storeroom for purchase and use.

5.9 **Pollution Prevention**

Ames Laboratory has incorporated many aspects into its operations to prevent pollution. To date, these activities include:

- Promoting source reduction through substitution using less toxic chemicals;
- Inventory control;
- Housekeeping and maintenance;
- Recycling/Reuse; and
- Environmentally preferred purchasing.

5.10 Greenhouse Gases (GHGs)

DOE has set goals to reduce its GHGs. Reductions include energy usage reductions, using sustainable energy (i.e. wind generated electricity), promoting carpooling and the use of hybrid vehicles, using alternative fuels, limiting business travel, and promoting bicycling, walking and mass transportation for commuting to work.

6.0 REPORTING

ESH&A annually collects and submits data required by DOE concerning waste minimization, recycling, and environmentally preferred purchasing. In addition, the [Site Environmental Report](#) and [Site Sustainability Plan](#) highlight some of the Laboratory's efforts in waste minimization and pollution prevention.